

REMARKS

Claims 1 and 13-36 are now in the application. Claims 13-36 are directed to the elected invention. Claim 1 is directed to a non-elected invention and may be canceled by the Examiner by allowance of the claims directed to the elected invention.

Claims 13-33 were rejected under 35 USC 103(a) as being unpatentable over applicant's admissions of prior art in view of U.S. Patent 5,876,490 to Ronay (inventor of this application). The cited references fail to render obvious the present invention.

The present invention according to one embodiment provides for increasing the polishing ratio of silicon dioxide to silicon nitride by including an anionic polyelectrolyte in the polishing slurry. In another embodiment, the present invention provides for increasing the ratio of a metal to silicon dioxide, silicon nitride, and/or silicon oxynitride by including a cationic polyelectrolyte in the polishing slurry. According to the present invention, as discussed in the paragraph bridging pages 4 and 5 of the specification, in order to achieve increased selectivity of polishing, the quantity of polyelectrolytes in the abrasive composition is in excess of the amount which absorbs on the surface of the abrasive particles and therefore is present in some extent in the composition as free or unabsorbed polyelectrolytes. It is believed that the portion of the polyelectrolyte in the supernatant portion of the slurry controls the polishing rate selectivity.

The "prior art admissions" relied upon by the examiner fail to render obvious the present invention since, among other things, as appreciated by the examiner these "prior art admissions" do not disclose the slurry compositions employed according to the present invention. Moreover, these "prior art admissions" do not suggest how to achieve increased polishing rate ratios that are obtainable according to the present invention.

More particularly, claim 13 and claims dependent thereon recite employing an anionic polyelectrolyte for increasing the polishing rate ratio of silicon dioxide to silicon nitride and claim 18 recites employing a cationic polyelectrolyte for increasing the polishing ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride.

Ronay fails to overcome the above discussed deficiencies of the "prior art admissions" with respect to rendering obvious the present invention. Ronay does not disclose that use of the slurry compositions therein could or should be used in a polishing process to enhance the polishing rate ratio of silicon dioxide to silicon nitride or the polishing rate ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride depending upon the type of polyelectrolyte employed.

Ronay does not disclose the use of the slurry compositions therein that contain an anionic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of silicon dioxide to silicon nitride. Also, Ronay does not disclose the use of the slurry compositions therein that contain a cationic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride. The disclosure of Ronay does not discuss this polishing selectivity. Accordingly, persons skilled in the art faced with the problems addressed by the present invention would not be lead by Ronay on how to solve the selectivity problem. Furthermore, since achieving the results obtainable by the present invention is extremely significant, if such were obvious it seems apparent that that such would have been disclosed by Ronay.

More particularly, compositions of U.S. Patent 5,876,490 are intended for planarizing microelectronics structures by having a fraction of the abrasive particles coated with a polyelectrolyte, which do not polish, while the rest of the particles remain uncoated and do polish (the coated particles segregate in the "down" areas (valleys), thereby preventing polishing there, while the uncoated particles polish the "up" areas (hills), thereby enhancing planarization). Therefore, employing excess polyelectrolyte would be contrary to these objectives. According to U.S. Patent 5,876,490, the charge of the polyelectrolyte is opposite to the charge of the abrasive particles. On the other hand, in the present invention, as discussed above, the charge of the polyelectrolyte is selected based upon the substrate to be polished. By way of example, adding poly(acrylic acid) to a silica slurry (silica is negatively charged), the poly(acrylic acid) would not adsorb onto the abrasive particles and thus would not improve the planarization; whereas, it will achieve selective polishing of silicon dioxide as compared to silicon nitride.

U.S. Patent 5,876,490 does not suggest selecting the type of polyelectrolyte depending upon the desired polishing selectivity as recited in claims 1 and 18.

Claims 13-17, 22-27 and 30-36 were rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 5,801,082 to Tseng in view of U.S. Patent 5,876,490 to Ronay. Tseng fails to render obvious the present invention since, among other things, as appreciated by the examiner Tseng does not disclose the slurry compositions employed according to the present invention. Moreover, Tseng fails to suggest any means whatsoever for achieving increased polishing rate ratios that are obtainable according to the present invention. Tseng does not even remotely discuss improved polishing rate ratios. Tseng merely mentions chemical-mechanical polishing as one of the steps in his process for making shallow trench isolation regions.

Ronay fails to overcome the above discussed deficiencies of Tseng with respect to rendering obvious the present invention. As discussed above, Ronay does not disclose that use of the slurry compositions therein that contain an anionic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of silicon dioxide to silicon nitride. Also, as discussed above, Ronay does not disclose the use of the slurry compositions therein that contain an anionic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of silicon dioxide to silicon nitride. Also, discussed above, Ronay does not disclose the use of the slurry compositions therein that contain a cationic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride. The disclosure of Ronay does not discuss this polishing selectivity. Accordingly, persons skilled in the art faced with the problems addressed by the present invention would not be lead by Ronay on how to solve the selectivity problem. Furthermore, since achieving the results obtainable by the present invention is extremely significant, if such were obvious it seems apparent that that such would have been disclosed by Ronay.

Also, as discussed above, compositions of U.S. Patent 5,876,490 are intended for planarizing microelectronics structures by having a fraction of the abrasive particles coated with a polyelectrolyte, which do not polish, while the rest of the particles remain uncoated and do

polish (the coated particles segregate in the "down" areas (valleys), thereby preventing polishing there, while the uncoated particles polish the "up" areas (hills), thereby enhancing planarization). Therefore, employing excess polyelectrolyte would be contrary to these objectives. According to U.S. Patent 5,876,490, the charge of the polyelectrolyte is opposite to the charge of the abrasive particles. On the other hand, in the present invention, as discussed above, the charge of the polyelectrolyte is selected based upon the substrate to be polished. By way of example, adding poly(acrylic acid) to a silica slurry (silica is negatively charged), the poly(acrylic acid) would not adsorb onto the abrasive particles and thus would not improve the planarization; whereas, it will achieve selective polishing of silicon dioxide as compared to silicon nitride.

Moreover, U.S. Patent 5,876,490 does not suggest selecting the type of polyelectrolyte depending upon the desired polishing selectivity as recited in claims 1 and 18.

Claims 18-21 and 28-29 were rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 5,814,236 to Booth, in view of U.S. Patent 5,896,490 to Ronay. Booth fails to render obvious the present invention since, among other things, as appreciated by the examiner Booth does not disclose the slurry compositions employed according to the present invention. Moreover, Booth fails to suggest any means whatsoever for achieving increased polishing rate ratios that are obtainable according to the present invention. Booth does not even remotely discuss improved polishing rate ratios. Booth merely mentions chemical-mechanical polishing as one of the steps in his process for forming a spatial light modulator.

Ronay fails to overcome the above discussed deficiencies of Booth with respect to rendering obvious the present invention. As discussed above, Ronay does not disclose that use of the slurry compositions therein that contain a cationic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride. Also, as discussed above, Ronay does not disclose the use of the slurry compositions therein that contain a cationic polyelectrolyte could or should be used in a polishing process to enhance the polishing rate ratio of metal to silicon dioxide, silicon nitride and/or silicon oxynitride. The disclosure of Ronay does not discuss this polishing selectivity. Accordingly, persons skilled in the art faced with the problems addressed by the present

invention would not be lead by Ronay on how to solve the selectivity problem. Furthermore, since achieving the results obtainable by the present invention is extremely significant, if such were obvious it seems apparent that such would have been disclosed by Ronay.

More particularly, compositions of U.S. Patent 5,876,490 are intended for planarizing microelectronics structures by having a fraction of the abrasive particles coated with a polyelectrolyte, which do not polish, while the rest of the particles remain uncoated and do polish (the coated particles segregate in the "down" areas (valleys), thereby preventing polishing there, while the uncoated particles polish the "up" areas (hills), thereby enhancing planarization). Therefore, employing excess polyelectrolyte would be contrary to these objectives. According to U.S. Patent 5,876,490, the charge of the polyelectrolyte is opposite to the charge of the abrasive particles. On the other hand, in the present invention, as discussed above, the charge of the polyelectrolyte is selected based upon the substrate to be polished. By way of example, adding poly(acrylic acid) to a silica slurry (silica is negatively charged), the poly(acrylic acid) would not adsorb onto the abrasive particles and thus would not improve the planarization; whereas, it will achieve selective polishing of silicon dioxide as compared to silicon nitride.

Moreover, U.S. Patent 5,876,490 does not suggest selecting the type of polyelectrolyte depending upon the desired polishing selectivity as recited in claims 1 and 18.

Concerning obviousness, *Graham V. John Deere*, 383 U.S. 1,148 U.S.P.Q. 459 (1966) outlines the approach that must be taken when determining whether an invention is obvious. In *Graham*, the Court stated that a patent may not be obtained if the subject matter would have been obvious at the time the invention was made to a person having ordinary skill in the art, but emphasized that nonobviousness must be determined in the light of inquiry, not quality. Approached in this light, §103 permits, when followed realistically, a more practical test of patentability. In accordance with *Graham*, three inquiries must be made in determining whether an invention is obvious:

- (1) The scope and content of the prior art are to be determined.
- (2) The difference between the prior art and the claims at issue are to be ascertained.
- (3) The level of ordinary skill in the pertinent art are resolved.

Against this background, the obviousness or nonobviousness of the subject matter is determined. Secondary considerations, such as commercial success, long felt but unsolved needs, failure of others, etc., can be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

In conjunction with interpreting 35 U.S.C. §103 under *Graham*, the initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor did, i.e. the Examiner must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

To establish a *prima facie* case of obviousness, three basic criteria must be met:

1. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference.
2. There must be a reasonable expectation of success.
3. The prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion the reasonable expectation of success must both be found in the prior art and not based on Applicants' disclosure. *In re Vaeck*, 947 F2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991). See MPEP § 2143-§2143.03 for decisions pertinent to each of these criteria.

The discussion in *In re Kotzab*, 55 U.S.P.Q. 2d 1313 (Fed. Cir. 2000) at page 1317 is also relevant wherein the Court stated:

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided by the prior art references and the then-accepted wisdom in the field. See *Dembiczak*, 175 F.3d at 990, 50 USPQ2d at 1617. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that

which only the invention taught is used against its teacher.¹ Id. (quoting W.L. Gore & Assoc., Inc. v. Garlock, Inc. 721 F.2d 1540, 1553, 220 USPQ 303,313 (Fed. Cir. 1983).

e this issue.

The mere fact that the cited art may be modified in the manner suggested by the Examiner does not make this modification obvious, unless the cited art suggest the desirability of the modification. No such suggestion appears in the cited art in this matter. The Examiner's attention is kindly directed to *In re Lee* 61 USPQ2d 1430 (Fed. Cir. 2002), *In re Dembicza et al.* 50 USPQ2d. 1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d. 1397 (Fed. Cir. 1989) and *In re Fritch*, 23, USPQ2d. 1780 (Fed. Cir. 1992).

In Dembicza et al., *supra*, the Court at 1617 stated: "Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc., v. M3 Sys., Inc., 157 F.3d. 1340, 1352, 48 USPQ2d. 1225, 1232 (Fed. Cir. 1998) (describing 'teaching or suggestion motivation [to combine]' as in 'essential evidentiary component of an obviousness holding'), *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d. 1453, 1459 (Fed. Cir. 1998) ('the Board must identify specifically...the reasons one of ordinary skill in the art would have been motivated to select the references and combine them');...".

Also, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under 35 USC 103. See *Diversitech Corp. v. Century Steps, Inc.* 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 187 USPQ 774 (CC)A 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d. 1923 (Fed. Cir. 1990), *In re Antonie*, 195,

USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property can be ignored in determining patentability and comparing the claimed invention to the cited art. Along these lines, see *In re Papesch*, supra, *In re Burt et al.*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

The present invention could only be derived from the cited art by the use of "hindsight", i.e. by knowing what Applicants' invention was in advance from Applicants' disclosure, and then *ex post facto* reconstructing Applicants' invention from the prior art after a thorough search. The prior art does not lead persons of ordinary skill in the art to discover a process for enhancing polishing rate ratio of silicon dioxide to silicon nitride or of metal to silicon dioxide, silicon nitride and/or silicon oxynitride. It is impermissible under 35 U.S.C. 103 to use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. See *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Furthermore, it is well settled that hindsight reconstruction using the patent application as a guide through the maze of prior art references, combining "the right references in the right way" so as to achieve the result of the claimed invention must be avoided. See *Grain Processing Corp. v. American Maize-Products Corp.*, 5 U.S.P.Q.2d 1788 (Fed. Cir. 1988).

The comments made by the Court in *AIR-vend, Inc. Throne Industries, Inc.*, 229 USPQ 505 at 515 (District Court, Minnesota, 1985) are appropriate here:

The question of obviousness, as the Court of Appeals for the Federal Circuit has acknowledged, is simple to ask, but difficult to answer...The difficulty in answering this question is due in no small part to the strong temptation to resort to and rely on hindsight in formulating the answer. Hindsight, however, is quite improper when resolving the question of obviousness. To use the patent in suit as a guide through the prior art references, combining the right references in the right way to arrive at the result of the claims in the suit is, therefore, also quite improper. Combining the teachings of the prior art to produce the claimed invention absent

some teaching, suggestion or incentive supporting this combination cannot establish obviousness.

The rejection of the claims is in the nature of "ought to be tried" which is an impermissible standard under 35 U.S.C. 103 (see Jones v. Hardy, 220 U.S.P.Q. 1021 [CAFC, 1984]).

In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to CBLH Deposit Account No. 22-0185.

Respectfully submitted,



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